

¹ Peregrine falcon were delisted on August 25, 1999 (64 FR 46541).

1.2 2001-2002 Aquatic Species Conference and Consultation

On December 7, 2000, the Service, based on our new regulatory jurisdiction for coastal cutthroat trout, recommended that the Corps initiate a conferencing process for Project effects to coastal cutthroat trout, and also informed the Corps about historic records of bull trout in the lower Columbia River (file number 8330.0563[01]). In March, 2001, informal consultation was initiated between the Service, NMFS, Corps, and Ports. On July 11, 2001, the Corps designated the six lower Columbia River Ports as non-Federal representatives for purpose of conference and consultation. On January 3, 2002, the Corps transmitted an aquatic species BA that addresses all NMFS' listed species, as well as the Service's coastal cutthroat trout and bull trout (Table 1), with minor additional analysis of Project effects to bald eagle and Columbian white-tailed deer.

A history of specific informal consultation and conference activities under the Act, between the August 25, 2000, NMFS' withdrawal of their 1999 biological opinion to current date, is presented on pages 1-11 to 1-15, and 7-1 of the aquatic species BA, and is incorporated herein by reference. The reinitiation of conference and consultation resulted in a re-evaluation of aquatic species issues via an independent, scientific, peer-review panel and a series of five public workshops; additional analysis by a multi-agency biological review team; and development and use of new analytical tools including two numerical models and an ecosystem-based conceptual model. During the reinitiation process, the Corps, NMFS, the Service, and Ports participated in a mutual analysis of Project effects, and subsequently negotiated Project modifications to minimize or avoid potential Project effects. To provide further assurances that the Project was successful in minimizing or avoiding adverse effects to proposed and listed species, Project monitoring activities and adaptive management requirements were developed and incorporated into the Corps' proposed action. Finally, during this deliberative process, the Services recommended numerous ecosystem research and restoration activities to help fulfill the Corps' responsibilities under section 7(a)(1) of the Act.

BIOLOGICAL AND CONFERENCE OPINIONS

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 Introduction

Subsequent to NMFS' August 25, 2000, withdrawal of its December 1999 Opinion, the Corps, sponsoring Ports, NMFS, and the Service developed a "reinitiation" framework to address NMFS' major concerns and to re-define, as necessary, the Project's proposed action. Several steps were involved in the development of the current proposed action, including a re-evaluation of potential Project effects, an analysis of these potential effects within the framework of an ecosystem-based conceptual ecosystem model, and the development of compliance measures and monitoring conditions based on the effects analyses. As part of the reinitiation process, the Corps, NMFS, the Service and the Ports identified additional monitoring, research, and adaptive management components of the proposed action. The Corps, Service, and the Ports also identified additional ecosystem restoration features to be included in the proposed action for the Project. The Corps' aquatic species BA fully describes this reinitiation process, and those descriptions are incorporated herein by reference. The following is a brief overview of the steps that led to the current Project's proposed action.

To facilitate discussion of the scientific questions raised by NMFS in their August 25, 2000, withdrawal letter, the Corps, NMFS, Service, and the Ports retained Sustainable Ecosystems Institute (SEI), a public-benefit, science mediation group. Using a panel of seven nationally-prominent technical experts, SEI provided an independent, scientific process to evaluate the potential environmental issues surrounding improvement of the navigation channel. A series of SEI workshops helped frame major concerns raised in connection with the proposed Project, and identify best available science for additional analysis of Project effects.

Beginning in early spring 2001, the Corps, NMFS, Service, and the Ports formed a technical group called the Biological Review Team (BRT). The BRT engaged in regular meetings to further review and address technical issues associated with the proposed Project and its potential effects. These BRT technical meetings were occurring during and after the SEI workshops, and incorporated the SEI workshop proceedings.

During the SEI workshop process, a conceptual ecosystem model was designed to provide an integrated description of the major ecosystem links that affect ecosystem structure and/or function as related to juvenile salmonid production and ocean entry (see Chapter 5 of the aquatic species BA). The specific objectives of the model were to:

- Provide an ecosystem-level scientific framework for evaluating the Project;
- Identify links among physical-chemical and biological indicators;

- Aid in the identification of ecosystem-based processes that link salmonids and potential effects of the Project; and
- Develop a systematic methodology to evaluate monitoring and adaptive management opportunities.

The conceptual ecosystem model describes the physical and biological interactions of the lower Columbia River (from Bonneville Dam downstream to the upper end of the estuary at RM 40), estuary (RM 40 to RM 3), and river mouth (RM 3 to the deep water disposal site) in a manner that, when they are properly functioning, help to characterize a properly functioning ecosystem. The conceptual ecosystem model was used by the BRT as an analytical tool for Project effects analyses. The Corps also conducted additional numerical modeling of hydraulic parameters (i.e., salinity, velocity, depth, and temperature) for the Lower Columbia River, estuary, and river mouth. Modeling analysis was done by both the Oregon Health and Science University/Oregon Graduate Institute (OHSU/OGI) and the Corps' Waterways Experiment Station (WES). The OHSU/OGI modeling was conducted to verify the previous conclusion of the WES modeling from the Corps' 1999 Final Environmental Impact Statement (FEIS; Corps 1999) and provide additional analyses on potential Project effects to habitat opportunity for juvenile salmonids (Bottom et al. 2001).

Ultimately, the Corps, NMFS, Service, and Ports reviewed each aspect of the original 1999 proposed action, and, using the best available science, including the SEI workshops, the numeric and conceptual models, and the BRT meetings, agreed upon the current proposed action for dredging and disposal activities. The BRT identified additional compliance measures and monitoring conditions in order to minimize or avoid Project effects. Finally, the BRT proposed an adaptive management process to review information from the compliance and monitoring activities and make necessary Project modifications to minimize and avoid impacts.

2.2 Proposed Action

The proposed action consists of several components that have been developed over the course of this consultation and conference. They include:

- The construction of the deeper navigation channel, employing a range of best management practices to avoid or minimize harm to species proposed and listed under the Act;
- Maintenance dredging to maintain navigation depths for the navigation channel and other associated features;

- The disposal of construction and maintenance dredged materials in suitable locations to avoid or minimize adverse effects on listed and proposed species and, where appropriate, improve ecological functions in the near shore area;
- The design and implementation of a robust Monitoring Program to evaluate implementation performance and ecological responses;
- Implementation of an adaptive management process to respond to future adverse effects.
- The implementation of ecosystem restoration efforts to improve ecological functions of significance to listed and proposed species in the Lower Columbia River and estuary; and
- The undertaking of an ecological research program to further reduce uncertainties and guide the adaptive management process over the life of the Project.

Each of these elements of the proposed action are summarized below. A more complete description of them is in the aquatic species BA (see Sections 3, 8, and 9) and are incorporated herein by reference.

The proposed action can be categorized into two distinct types of activities: deepening of the navigation channel (includes turning basins and berths that are interrelated and/or interdependent to the Project); and ecosystem restoration and research. Associated with the navigation channel improvements and ecosystem restoration and research activities are compliance, monitoring, and adaptive management actions.

Navigation channel improvements will require two main actions: Dredging and disposal of dredged materials. Dredging and disposal of dredged materials will occur in two stages: an initial construction program to deepen the existing navigation channel, turning basins, and berths that are interrelated and/or interdependent to the Project, and a subsequent program to maintain the deepened navigation channel and turning basins. The construction phase will last 2 years, and the maintenance phase will last the remainder of the authorized Project life.

Deepening of the lower Willamette River, which had been a component of the authorized Project and discussed in the 1999 FEIS, is not reasonably certain to occur. Portions of the Lower Willamette River have been designated as a federal National Priorities List site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Construction of the Project's lower Willamette River features has been deferred pending study

and selection of an appropriate remedy for cleanup under CERCLA. Because the lower Willamette River navigation channel deepening is not reasonably certain to occur, this potential future federal action is not addressed in these Service opinions.

Construction and maintenance dredging at lower Columbia River berths associated with three grain facilities, one gypsum plant, and one container terminal, represent actions that are interrelated and/or interdependent to the Project. Therefore, these Service opinions analyze the effects to coastal cutthroat trout and bull trout from these berth deepening and maintenance activities. However, these Service opinions do not provide incidental take coverage for berth dredging, as these activities will undergo future Act consultation. The future Act consultation will initiate upon the Service's receipt of applications for Federal permits, prior to berth dredging activities.

The Corps proposes to increase the depth of the Columbia River navigation channel, from its presently authorized -40 Columbia River Datum (CRD) feet, to -43 CRD feet. "Advanced maintenance" dredging will occur during the Project's construction and maintenance components, including advanced maintenance dredging for up to 100 feet overwidth and 5 feet overdepth for a maximum constructed navigation channel depth of 48 feet. This is a standard practice for operation and maintenance of the current 40-foot channel and is used to insure a safe operational depth between operation and maintenance dredging periods. The current navigation channel's 600-foot width will be maintained, with additional channel width at channel turns and areas of high-reoccurrence of shoaling. The improved navigation channel will exist in the same location as the current -40 foot navigation channel. In addition, a total of three existing turning basins would be deepened to -43 CRD feet and maintained as part of the proposed action. Currently existing lower Columbia River berths at three grain facilities, one gypsum plant, and one container terminal, interrelated and/or interdependent to the Project, will be deepened to -43 CRD feet and maintained.

The Corps proposes to deepen the navigation channel from River Mile (RM) 3 to RM 105.5 on the Columbia River (see section 1.2.1 of the aquatic species BA). An estimated total of 19 million cubic yards (mcy) of sand, 76,000 cubic yards (cy) of basalt rock, and 240,000 cy of cemented sand, gravel, and boulders would be initially removed from the navigation channel using hopper, clamshell, and pipeline dredges. Once the improvements are completed, the channel will require annual maintenance dredging. Over the initial 20 years, annual maintenance dredging is expected to decline from around 8 mcy to about 3 mcy of sand annually as the new channel reaches equilibrium. Annual maintenance will then continue at an average of about 3 mcy of sand per year for the succeeding 30-years. This amounts to a total Project dredging quantity of about

190 mcy for the Project. During this same 50 year period without the 43 foot project, approximately 160 mcy would be dredged to maintain the 40 foot channel.

The Corps is proposing to employ contractors, Federal and Port personnel, vessels, and equipment to implement the Project's dredging and disposal activities. Channel construction and maintenance will encompass a variety of dredging and dredged material disposal methods, as well as associated impact minimization measures. The Service has reviewed each component of the proposed action to develop additional impact minimization and best management practices (BMPs). These BMPs have been incorporated by the Corps as a component of the proposed action. The following is a general discussion of the pre-construction planning, dredging and disposal methods, locations, and impact minimization measures.

2.2.1 Navigation Channel Shoals that are Less than 48 Feet Deep

Construction and maintenance dredging activities will mainly focus on navigation channel shoals that are less than 48 feet deep. These channel features will be resurveyed prior to construction and maintenance dredging activities, and dredging activities will be localized and limited to these shallow shoal features.

2.2.2 Construction and Maintenance Dredging

The following best management practices (BMPs), including Project compliance activities, will apply to Project construction and maintenance dredging (Table 2.1). These BMPs for the dredging actions are designed to avoid or minimize potential for adverse effects upon or take of coastal cutthroat trout and bull trout. Construction and maintenance dredging BMPs will remain in effect during the life of the Project, or until new information becomes available that would warrant change (see Section 2.2.6, below).

Contractors or other construction and maintenance workers will employ the following methods described in Table 2.1, as appropriate, to most efficiently complete the construction and maintenance dredging activities. Contractors and other workers will be required to conduct dredging activities in compliance with the proposed action, including full implementation of BMPs, compliance monitoring, and reporting. Section 7.3 of the aquatic species BA contains a more complete description of the compliance monitoring program. It is incorporated herein by reference.

Table 2.1. Dredging Methods, Descriptions, and Associated Best Management Practices

Dredging Method	Description (also refer to Aquatic Species BA)	Best Management Practices
Hopper	Use dual dragarms to lower dragheads onto substrate. River bed materials are removed via suction to transport materials into the hold of the vessel. Generally used for small sand shoals in river and large sand shoals in estuary.	<ul style="list-style-type: none"> -Minimize entrainment by maintaining, to the extent possible, the draghead below substrate. Pumping must stop if dragarm is raised more than 3 feet above substrate. -Minimize turbidity by maintaining, to the extent possible, the draghead below substrate. -Contracts will specify compliance plans
Mechanical	Use bucket to remove materials and transfer to a barge for transport. Includes clamshell, dragline, and backhoe dredges. Mainly used during construction phase for removal of cemented sands, gravels, and fractured rock. Limited maintenance application, mainly in confined areas.	<ul style="list-style-type: none"> -Contractors will specify compliance plans -Future berth deepening and maintenance will occur within timing window of November 1-February 28
Pipeline	Use cutterhead on end of long arm to remove sediments. River bed materials are removed via suction to a floating pipeline. The pipeline delivers the river bed materials to the disposal location.	<ul style="list-style-type: none"> -Minimize entrainment by maintaining, to the extent possible, the draghead below substrate. Pumping must stop if cutterhead is raised more than 3 feet above substrate. -Minimize turbidity by maintaining, to the extent possible, the cutterhead below substrate. -Contractors will specify compliance plans
Drilling and Blasting	Associated with channel construction at basalt rock outcrops. Holes would be drilled in underwater rock formation, and charges set to create an implosion.	<ul style="list-style-type: none"> -A blasting plan would be developed for each site. -Implosion rather than explosion. -Over-pressure from blast less than ten psi. -Monitoring of blasts. -Fish “hazing” employed prior to blast. -Timing window of November 1-February 28.

Project construction dredging, using any of the aforementioned dredging methodologies, may occur year-round until the navigation channel and turning basin deepening is complete. Future berth deepening will occur within timing window of November 1-February 28. Another exception to the aforementioned in-water work window “waiver” is removal of rocks via blasting. Any rock blasting would have an in-water timing requirement from November 1 to February 28.

Project maintenance dredging for navigation channel or turning basin features will not have any in-water timing restrictions. However, the Corps has traditionally implemented navigation channel maintenance dredging from May through October, and anticipates Project maintenance dredging to occur during May 1 to October 31 annually. Future berth maintenance dredging will occur within timing window of November 1-February 28.

2.2.3 Construction and Maintenance Disposal Activities

Dredged materials from Project construction and maintenance will be disposed of in upland, flowlane, shoreline, mitigation sites, ecosystem restoration features, and one ocean disposal location. Most of the Project’s dredged material would be disposed of on upland locations. All dredged materials destined for flowlane, shoreline, and ocean disposal will not exceed thresholds for sediment composition and quality, as identified in the Corps’ and Environmental Protection Agency’s Dredged Materials Evaluation Framework (DMEF). The following list shows the various disposal options and volumes of dredged material that could potentially be placed. Following the Corps’ public process on the supplemental integrated feasibility report/EIS, the disposal plan will be finalized. Disposal options and the associated material volume for the first 20 years include:

- 29 upland locations covering 1,755 acres (71 mcy)
- ocean (16 mcy - the proposed Lois Island and Miller/Pillar ecosystem restoration actions may use dredged materials scheduled for ocean disposal, and would significantly reduce the total ocean disposal volume [L. Hicks, pers. comm.]);
- flowlane (23 mcy);
- shoreline (1 mcy);

- two ecosystem restoration features (15 mcy); and
- one mitigation site (1 mcy)

The following methods, and associated BMPs, will be used for dredged material disposal (Table 2.2). These BMPs will apply to Project disposal actions to avoid or minimize impacts to coastal cutthroat trout and bull trout. Material disposal BMPs will remain in effect throughout the Project, or until new information becomes available that would warrant change (see Section 2.2.6 below).

Table 2.2. Disposal Methods, Descriptions, and Associated Best Management Practices.

Disposal Method	Description (also refer to BA)	Best Management Practices
Upland	Materials pumped via slurry pipeline or hauled to upland site. Materials permanently held at upland site via earthen dikes. Any shoreline site associated with upland disposal will be restored. Existing upland disposal sites may not have habitat buffer; all new sites will have 300 foot habitat buffer.	-Upland sites bermed to maximize settling of fine materials. -New upland sites located a minimum of 300 feet from shoreline or other aquatic habitat feature. -Riparian vegetation will be protected. -Vegetative restoration will occur.
Flowlane	Either hopper or pipeline methods will use flowlane disposal. Dredged materials will be released into deep water sites within or adjacent to navigation channel.	-Maintain discharge pipe of pipeline dredge at depths greater than 20 feet. -Dispose of material in a manner that prevents in-water mounding.
Shoreline	Pipeline method primarily used for shoreline disposal. A sand and water slurry is pumped onto an existing beach or shoreline landing, and the beach is extended approximately 100-150 feet into and for varying distances along the river channel. Shoreline disposal occurs concurrently with dredging; timing restrictions therefore based on dredging methodology.	-Contour new beach to minimum steepness of 10-15% slope, to prevent fish stranding. -Only highly-erosive, and therefore lower habitat quality, shoreline sites will be used.
Ocean	A single, 200-300 foot deep ocean location, approximately 4.5 miles west of the Columbia River mouth, will be used for ocean disposal. Hopper dredges will release dredged materials in an 11,000 by 17,000 foot area.	-No ESA BMPs. -Dispose of material in accordance with the site monitoring and management plan which calls for a point dump placement of material from the project during construction. The plan is to place any construction material in the southwest corner of the deep water side.

Disposal Method	Description (also refer to BA)	Best Management Practices
In-water fill	In-water fills will be used to create intertidal marsh and flats, shallow sub-tidal habitat at Miller Pillar, Lois Island Embayment and the Martin Island mitigation site.	Historic elevations for tidal marsh and flats and shallow subtidal habitats at these locations will be constructed using clean dredged material.

Project disposal activities will not have any in-water timing restrictions. However, as disposal occurs at the same time as dredging activities, dredged material disposal associated with construction dredging will occur year round whereas disposal associated with maintenance dredging most likely will occur from May through October.

2.2.4 Additional Provisions for Protection of Water Resources

Additional provisions regarding release of trash, garbage, hazardous waste, or other contaminants will be implemented during dredging and disposal activities (Table 2.3).

Table 2.3. Additional Provisions for Protection of Water Resources

General Measure	Action
The contractor shall not release any trash, garbage, oil, grease, chemicals, or other contaminants into the waterway.	<ul style="list-style-type: none"> -If material is released, it shall be immediately removed and the area restored to a condition approximating the adjacent undisturbed area. -Contaminated ground shall be excavated and removed and the area restored as directed. -Any in-water release shall be immediately reported to the nearest U.S. Coast Guard Unit for appropriate response.
The contractor, where possible, will use or propose for use, materials that may be considered environmentally-friendly in that waste from such materials is not regulated as a hazardous waste or is not considered harmful to the environment. If hazardous wastes are generated, disposal of this material shall be done in accordance with 40 CFR parts 260-272 and 49 CFR parts 100-177.	<ul style="list-style-type: none"> -If material is released, it shall be immediately removed and the area restored to a condition approximating the adjacent undisturbed area. -Contaminated ground shall be excavated and removed and the area restored as directed. -Any in-water release shall be immediately reported to the nearest U.S. Coast Guard Unit for appropriate response.

2.2.5 Locations for Construction and Maintenance Dredging and Dredged Material Disposal

Construction and maintenance dredging and dredged material disposal locations are identified by river reach (Table 2.4). Dredged material removed from a reach of the river could be disposed in a location in a different reach of the river. The table is only intended to display the dredging location and disposal location within a given reach, not to infer material movement from a location to a location. Unrestrained open water (flow lane) disposal of suitable dredged materials may occur anywhere in or immediately adjacent to the navigation channel, and at any time in the Project area, RM 3-106.5.

Table 2.4. Proposed Dredging Locations, Disposal Locations, and Types of Disposal

River Reach	Dredge Locations	Disposal Locations, Type (U=upland, F=flowlane, S=shoreline, I=in-water)
Reach 1 RM 98-106.5	Lower Vancouver Bar (RM 101.3-104.6) Morgan Bar (RM 97.8-101.3) Vancouver Turning Basin (RM 105.5) Terminal 6 Berths (3 berths) (RM 100-101) United Harvest Berth (RM 105.2)	West Hayden Island (RM 105.0) U Gateway 3 (RM 101.0) U Entire Reach F
Reach 2 RM 84-98	Willow Bar (RM 93.9-97.8) Henrici Bar (RM 90.4-94.9) Warrior Rock Bar (RM 87.3-90.4) St. Helens Bar (RM 83.3-87.3)	Fazio Sand & Gravel (RM 96.9) U Adjacent Fazio (RM 96.9) U Lonestar (RM 91.5) U Railroad Corridor (RM 87.8) U Austin Point (RM 86.5) U Sand Island (RM 86.2) S Entire Reach F
Reach 3 RM 70-84	Upper Martin Island Bar (RM 80.3-83.8) Lower Martin Island Bar (RM 76.5-80.3) Kalama Ranges (RM 72.8-76.5) Upper Dobelbower Bar (RM 69.9-72.8) Kalama Export Grain Berth (RM 73.4) Port of Kalama Berth (RM 77.1) Kalama Turning Basin (RM 73.5)	Reichold (RM 82.6) U Martin Bar (RM 82.0) U Martin Island Lagoon (RM 80) I Lower Deer Island (RM 77.0) U Sandy Island (RM 75.8) U Northport (RM 71.9) U Cottonwood Island (RM 70.1) U Entire Reach F
Reach 4 RM 56-70	Lower Dobelbower Bar (RM 67.1-69.9) Slaughters Bar (RM 63.2-67.1) Walker Island Reach (RM 59.4-63.2) Stella-Fisher Bar (RM 55.6-59.4) U.S. Gypsum Berth (RM 65.7)	Howard Island (RM 68.7) U International (RM 67.5) U Rainier Beach (RM 67.0) U Rainier Industrial (RM 64.8) U Lord Island (RM 63.5) U Reynolds Aluminum (RM 63.5) U Mt. Solo (RM 63.5) U Hump Island (RM 59.7) U Crims Island (RM 57.0) U Entire Reach F
Reach 5 RM 40-56	Gull Island Bar (RM 51.9-55.6) Eureka Bar (RM 48.2-51.9) Westport Bar (RM 44.5-48.2) Wauna and Driscoll Ranges (RM 40.8-44.5)	Port Westward (RM 54.0) U Brown Island (RM 46.3) U Puget Island (RM 44.0) U James River (RM 42.9) U Entire Reach F

River Reach	Dredge Locations	Disposal Locations, Type (U=upland, F=flowlane, S=shoreline, I=in-water)
Reach 6 RM 29-40	Puget Island Bar (RM 36.6-40.8) Skamokawa Bar (RM 32.6-36.6) Brookfield-Welch Island Bar (RM 28.8-32.6)	Tenasillahe Island (RM 38.3) U Welch Island (RM 34.0) U Skamokawa (RM 33.4) S Entire Reach F
Reach 7 RM 3-29	Pillar Rock Ranges (RM 25.2-28.8) Miller Sands Channel (RM 21.4-25.2) Tongue Point Crossing (RM 17.5-21.4) Upper Sands (RM 13.6-17.5) Flavel Bar (RM 10.0-13.6) Upper Desdemona Shoal (RM 4.4-10.0) Lower Desdemona Shoal (RM 3.0-4.4) Astoria Turning Basin (RM 13)	Pillar Rock Island (RM 27.2) U Miller Sands (RM 23.5) S Rice Island (RM 21.0) U Entire Reach F
River Mouth RM 3-ocean	None	“Point dump” placement within southwest corner of deep water ocean site

2.2.6 Monitoring Program and Adaptive Management Process

As part of the Project, the Corps will implement a Monitoring Program. Monitoring actions were identified during the BRT’s review and analysis of Project-related, short- and long-term, direct and indirect effects; discussions of relative risk of Project effects; and the certainty surrounding data used to determine risk. These monitoring activities will gather information to monitor and evaluate predicted effects to coastal cutthroat trout and bull trout, validate assumptions used in the aquatic species BA’s effects analysis, and reduce overall risk and uncertainty associated with implementation of the Project’s actions.

Table 2.5 provides a brief overview of the proposed Monitoring Program. The entire description of the Monitoring Program (see Chapter 7, Table 7-3 of the aquatic species BA) is incorporated by reference into these Service Opinions. Compliance monitoring will also occur during dredging and disposal activities for both construction and maintenance periods. Compliance monitoring was previously described in Construction and Maintenance Dredging section, above.

For this Project, the Corps will use the 1998 regional DMEF protocols governing testing and evaluation of sediment to be dredged. The DMEF establishes minimum guidelines for testing and evaluation. The DMEF guidelines require the use of available sediment and contaminants information to make a preliminary determination concerning the need for testing of material proposed for dredging. Where available information suggests additional testing is required,

sediments will be collected and analyzed prior to dredging and disposal. Otherwise, DMEF minimum sampling guidelines require a periodic testing of sediments for long term activities.

Table 2.5. Key Components of Monitoring Program

Monitoring Task	NMFS and Services' Concerns	Data Analysis	Duration	Management Trigger Points
MA-1: Maintain three hydraulic monitoring stations: One downstream of Astoria, one in Grays Bay, and one in Cathlamet Bay. Parameters measured would include salinity, water surface elevation, and water temperature.	Long-term physical parameter changes related to Project.	An analysis would be conducted to determine pre- and post-project relationships among flow, tide, salinity, water surface, and temperature.	7 years: 2 years before, 2 years during, and 3 years after construction.	Post-project monitoring data exceeds defined threshold values (to be developed by adaptive management team).
MA-2: Monitor annual dredging volumes; both from construction and O&M activities.	Dredging volumes may be larger than predicted.	Actual volumes will be compared to predicted.	Life of the project.	Actual dredging volumes exceed capacity of the disposal plan.
MA-3: Conduct main channel bathymetric surveys throughout Project area.	Side-slope adjustments may occur in other locations, and within sensitive aquatic habitats, than predicted.	Bathymetric changes will be tracked to determine if habitat is altered.	7 years: 2 years before, 2 years during, and 3 years after construction	Salmonid habitat alteration adjacent to navigation channel due to side-slope adjustment.
MA-4: Repeat estuary habitat surveys being conducted by NMFS.	Long term macro- and micro-habitat changes related to Project	Habitat mapping from aerial photos and ground surveys.	One time survey conducted 3 years after completion of the deepening.	Changes to individual habitat types that are based on defined threshold values. Determine need for other surveys.

Monitoring Task	NMFS and Services' Concerns	Data Analysis	Duration	Management Trigger Points
<p>MA-5: The Corps, NMFS, and Service will annually review any new sediment chemistry from the lower Columbia River and estuary from sources such as the SEDQUAL database and known permit applications. These agencies will determine if these data exceed DMEF or NMFS contaminants guidelines for salmonid protection. If problems are found, additional sediment and contaminant sampling would be initiated in accordance with the DMEF manual. In addition, the Corps, NMFS, and Service will meet as new circumstances arise to review new data that indicates a changed condition that would trigger the need for additional sediment testing. Changed conditions include events such as spills, new listing of chemicals, changes in guidelines or threshold values, or any other indicator that suggests there is a reason to believe further testing may be required.</p>	<p>Ensure that channel construction and maintenance does not disturb undetected deposits of fine-grained material, potentially causing redistribution of contaminants that could pose a risk to salmon and trout.</p>	<p>New Corps sediment data, collected in response to the annual MA-5 monitoring action, will be reviewed in accordance with the DMEF manual and will be compared to the NMFS contaminants guidelines for the protection of salmon and trout.</p>	<p>Two years before construction, two years during construction, and annually during maintenance activities.</p>	<p>Any exceedance of NMFS or DMEF guidelines will be reported to the Adaptive Management Team to determine if consultation should be reinitiated.</p>

Monitoring Task	NMFS and Services' Concerns	Data Analysis	Duration	Management Trigger Points
MA-6: Monitor the incidence of stranding of juvenile salmonids on beaches in action area. Field surveys will be made monthly at selected beaches (upper, mid, and lower river) during the April-August out-migration to measure the number of fish being stranded along beaches.	Concern that disposal sites and ship traffic may allow for juvenile salmonid stranding.	Compare pre- and post-project stranding counts.	One year before deepening and 1 year after deepening.	If there is an increase in the number of fish stranded, proposals would be developed and presented to adaptive management team.

The Corps' analysis of available lower Columbia River and estuary information revealed few samples with fine materials and no samples with contaminant concentrations that exceed the regional DMEF guidelines or NMFS guidelines protective of listed salmon and trout. The Corps will test channel sediments in accordance with the DMEF guidelines, at a minimum of every 10 years in the main channel for sandy areas, every seven years for fine grained areas with no history of contamination at all, and every seven years where there is reason to believe contaminants may be present (Table 2.6). As noted in the aquatic species BA Table 7-3, Monitoring Action MA 5, all information collected during these sediment and contaminant reviews will be reported to the adaptive management team.

Table 2.6. Sediment Testing Locations and Frequency Minimums

Dredging Location	Frequency of Sampling (Yrs)
Main Channel RM 3-106.5	10
Turning Basins	
Astoria Turning Basin (RM 13)	7
Kalama Turning Basin (RM 73.5)	10
Vancouver Turning Basin (RM 105.5)	10
Berths	
United Harvest at Port of Vancouver (RM 104.2)	10
Harvest States at Port of Kalama (RM 77.1)	10

Peavy Grain at Port of Kalama (RM 73.4)	10
Terminal 6 at Port of Portland	7
U.S. Gypsum at Port of Rainier (RM 65.3)	10

The Corps also proposed an Adaptive Management Process. The aquatic species BA (section 9.4) indicates: “Actions associated with dredging and disposal, and ecosystem restoration and research will be coordinated through the Adaptive Management Process to ensure that the Project will not jeopardize listed or proposed species or destroy or adversely modify their critical habitat”. The proposed Adaptive Management Process involves review and management response to two types of Project monitoring data: Constant monitoring of Project effects during construction and maintenance activities (compliance monitoring), and annual review of monitoring data or other new information. In addition to annual review, any adverse finding from compliance monitoring would be addressed immediately by the adaptive management team. The proposed adaptive management review and response will ensure unanticipated Project effects are rapidly identified and effectively addressed. Finally, adaptive management will be used to evaluate whether the Project’s environmental protection objectives are being met, and to ensure construction and/or maintenance actions are adjusted accordingly.

The Corps’ proposed Adaptive Management Process requires establishment of an identified scope including goals, milestones for completion, check-in points, triggers for management changes (i.e., management decision points that include specific metrics), and sampling/testing protocols. The Corps, working with the Services, will further refine and develop goals and scope of the Adaptive Management Process. However, the following specific adaptive management actions are identified in the aquatic species BA (section 9.0):

- An adaptive management team, comprised of representatives from NMFS, Service, Corps, and sponsor Ports, will annually review results of Project compliance measures, monitoring, research, and restoration actions. On an annual basis the adaptive management team will determine:
 - if the Project is in compliance with these Service opinions,
 - if adverse Project effects have been found
 - if any modification to the Project’s compliance, monitoring, research, and restoration actions are warranted

- If an unanticipated effect is identified, the adaptive management team will determine whether: (1) the Project should continue; (2) construction or maintenance should be altered; (3) additional ecosystem restoration should be completed; (4) construction or maintenance should be stopped until more data is collected; or (5) the construction activities should be halted.

The Corps will be responsible for determining how to implement the adaptive management team decisions on addressing adverse Project effects. Annual reviews by the adaptive management team will occur for the duration of monitoring actions proposed in the aquatic species BA. The adaptive management team shall make all monitoring and research data available for public review.

2.2.7 Ecosystem Restoration and Research Actions

The Corps has incorporated ecosystem restoration and research actions into the proposed action to assist with the recovery of coastal cutthroat trout and bull trout habitats, and to further our understanding of lower Columbia River and estuary ecosystem functions and processes. These actions are not proposed to directly mitigate or compensate for any Project-related impacts to coastal cutthroat trout and bull trout. The research and restoration components of the overall ecosystem restoration and research action are proposed as Conservation Measures under Section 7(a)(1) of the Act and have been included into the proposed action by the Corps. These actions are the Corps' commitment to fulfill their affirmative responsibility to assist with conservation and recovery of proposed and listed species, including coastal cutthroat trout and bull trout. These actions include those ecosystem restoration actions previously authorized under Section 101(b)(13) of the Water Resource Development Act of 1999, and additional ecosystem restoration actions developed during the reinitiation of consultation and BRT discussions.

2.2.7.1 Ecosystem Restoration Activities

As part of the Project's dual purpose and need, the Corps has proposed a total of 10 ecosystem restoration actions (Table 2.7). These projects are designed to create or improve salmonid habitat, specifically tidal marsh, swamp, and shallow water and flats habitat, and to improve fish access to these habitat features. In addition, one of the ecosystem restoration actions proposes to restore habitat and reintroduce Columbian white-tailed deer onto Cottonwood/Howard islands. The aquatic species BA (see Chapter 8 of these Service Opinions) provides a detailed description of these restoration activities. Those descriptions are incorporated herein by reference. All ecosystem restoration activities, except for the long-term Tenasillahe Island restoration feature, will be initiated during the Project construction period.

Table 2.7. Proposed Ecosystem Restoration Activities

Action	Purpose	Protective Measures	Monitoring
Lois Island Embayment Habitat Restoration	Restoration of 389 acres of estuarine, intertidal marsh habitat and shallow subtidal flats habitat	-Use of deep water sediment storage location without in-water work window -In-water work window for material placement at Lois Island restoration feature	Post-construction benthic productivity and fish species composition and density on restoration and adjacent control sites
Purple Loosestrife Control Program	Implement an Integrated Pest Management Plan for purple loosestrife in the estuary, RM 18-52	-Only an EPA-approved over-water herbicide will be used -Application via methods that minimize herbicide contact with water	Annual and final reports describing results of control efforts
Miller/Pillar Habitat Restoration	Re-establish 170 acres of shallow water and flats habitats	-Place dredged materials in a fashion to minimize fish and prey smothering -Bird excluders placed on pile dikes	Post-construction benthic productivity and fish species composition and density on restoration and adjacent control sites
Tenasillahe Island Interim Restoration (Tidegate and Inlet Improvements)	Improve fish passage and water circulation between sloughs and the river	-Contingent upon hydraulic analysis that ensure new features will protect Columbian white-tailed deer -August-September in-water work window	Post-construction benthic productivity and fish species composition and density on restoration and adjacent control sites, annual reporting
Tenasillahe Island Long-Term Restorations (Dike Breach)	Long-term restoration of historical habitat features, including	-Upon Columbian white-tailed deer delisting -Must be compatible with Refuge purposes and goals -No protective measures proposed	Post-construction benthic productivity and fish species composition and density on restoration and adjacent control sites, annual reporting
Cottonwood/Howard Island Proposal Columbian White-tailed Deer Introduction	Secure habitat and reintroduce Columbian white-tailed deer	-None proposed	Monitoring to assess success of translocation, and annual reports

Action	Purpose	Protective Measures	Monitoring
Bachelor Slough Enhancement	Restore aquatic and riparian habitat resources	-Inwater dredging window -Dredge and disposal plan to be developed -Sediment chemistry test to be conducted	Monitor fish use of Bachelor Slough for 5 years, and annual and final reports
Shillapoo Lake Restoration	Creation of interior wetland cells for waterfowl and other wildlife species	None proposed	None proposed
Columbia River Tidegate Retrofits	Improve fish passage at Columbia River and tributary tidegates	-Late summer installation -Short duration construction events	None proposed
Walker-Lord and Hump-Fisher Islands Improved Embayment Circulation	Dredge connecting channels between islands to increase water circulation	-Late summer installation -Minimal turbidity anticipated	None proposed
Martin Island Embayment ¹	Development of 32 acres of tidal marsh habitat.	-Utilize sand as fill material to minimize Project-related turbidity -Contain all turbidity within project area	None proposed

¹ The Martin Island embayment feature is a mitigation requirement from the 1999 FEIS. This action was designed to mitigate for upland disposal impacts. The Corps has requested consultation on this action, as construction of this beneficial feature could have impacts to ESA-listed salmonids

2.2.7.2 Ecosystem Research Activities

Ecosystem research actions are conservation measures proposed by the Corps as part of the proposed action to assist the efforts of the Corps, NMFS, Service, and others in the broader understanding of the Lower Columbia River ecosystem, and assist with the recovery of coastal cutthroat trout and bull trout (Table 2.8). The aquatic species BA (see Chapter 8, Table 8-1) provides a tabular description of these research actions, and is incorporated herein by reference. These research actions were negotiated and designed by the BRT to provide useful information to the recovery of the coastal cutthroat trout and bull trout. The proposed research activities also address specific ecosystem conceptual model indicators that are believed to be improperly functioning.

Table 2.8. Proposed Ecosystem Research Actions

Research Task	Justification	Duration	Data Analysis
Add two additional transects in different habitat types similar to those being done for the NMFS studies currently under way with annual fish evaluation process.	Provide additional habitat and salmonid distribution information for the estuary. Useful in establishing inventory information for future monitoring or restoration.	Begin before construction and for 3 years after completion of the Project construction phase.	Record value and use of different habitat types for juvenile salmonids and cutthroat trout.
Evaluate cutthroat trout use of the estuary and river areas.	Little is known about the species use of this habitat. Research to provide additional information regarding coastal cutthroat trout use of this habitat.	Conduct study for 2 years before construction and 2 years during construction.	Record value and use of different habitat types by cutthroat trout.
Conduct bank-to-bank hydrographic surveys of the estuary.	Has not been done in 20 years and is needed to assess available habitat and restoration actions.	Once, prior to construction.	Bathymetry will be available for shallow water areas in the estuary.
In conjunction with ongoing studies of juvenile salmonids habitat utilization in the Lower Columbia River, collect and analyze juvenile salmonids and their prey for concentrations of chemical contaminants.	Provide additional data on contaminants in listed salmonids and their prey. Useful in establishing inventory information for future monitoring or restoration.	Begin before Project construction and for 3 years after construction phase, depending on the results.	Record concentrations of persistent contaminants (e.g., DDTs, PCBs, PAHs, dioxin-like compounds) in juvenile salmonids and prey.
In conjunction with above contaminant study, assess sublethal effects of contaminants (e.g., growth, disease resistant) on salmonids.	Provide additional data for established contaminants thresholds effect levels to ensure that guidelines are Protective of salmonids; to better characterize performance of juvenile salmonids in the estuary.	Begin before construction and for 3 years after construction phase, depending on the results.	Record health status of juvenile salmonids collected above.
Estuarine Turbidity Maximum (ETM) workshop.	To further the knowledge of the ETM and the listed stocks.	Once.	Not required.

3.0 STATUS OF THE SPECIES

The terrestrial species opinion reviewed the rangewide status of bald eagle and Columbian white-tailed deer, and this information is incorporated herein by reference. No additional rangewide